

the fifth short and broad, and the sixth broad and long, followed by a yellow spot; there are also two short transverse yellow bands at the back of the pectus. Legs black; coxæ red; front trochanters and femora yellow beneath. Abdomen black; the basal segments banded and striped with yellow, varied with red; the others with long yellow dorsal stripes, as far as the 7th segment, where the stripes, which are separated by the dorsal carinæ, are most conspicuous; anal appendages of male as long as the 8th segment, the lower one not much shorter; upper ones black; lower one red, black-pointed, nearly as long as the upper ones; appendages of the second segment of the abdomen small. Wings of a slightly yellowish hyaline, stained with saffron at the extreme base of the hind wings; pterostigma brown, slightly inclining to yellowish between the nervures: fore wings with thirteen or fourteen antenodal and nine postnodal nervures, the last nodal and the first two or three postnodals not continuous, nodal sector slightly waved before the middle; triangle traversed, followed by three rows of cells, increasing towards the hind margin; three post-triangular cells: hind wings with nine to eleven antenodal and nine or ten post-nodal nervures; membranule of moderate size, grey.

Much resembles a species which I have just described from St. Vincent (and var. ? from Grenada), West Indies, under the name of *D. multipunctata*; but in that species the markings differ somewhat, and the frontal tubercle is always violet-blue, whereas it is concolorous in *D. Broadwayi*.

## PROCEEDINGS OF LEARNED SOCIETIES.

### GEOLOGICAL SOCIETY.

June 20, 1894.—Dr. Henry Woodward, F.R.S.,  
President, in the Chair.

The following communications were read:—

1. 'The Bargate Beds of Surrey, and their Microscopic Contents.' By Frederick Chapman, Esq., F.R.M.S. (Communicated by Prof. T. Rupert Jones, F.R.S., F.G.S.)

This is an attempt to correlate the Bargate Beds of Guildford and its vicinity with the members of the Lower Greensand as known elsewhere in the S.E. of England.

1. The strata at Littleton quarry, near Guildford, are described in detail; the *remanié* fossils, oolitic ironstone, and other material derived from older rocks are noticed; the abundant occurrence of Ostracoda and Foraminifera in a particular clay-band is noted,

and the method adopted for getting them free from the matrix is described. The residuary minerals left from the washed sand of this clay-band, and comprising zircon, rutile, tourmaline, kyanite, quartz, felspar, and glauconite, have been carefully studied and described for the Author by Dr. W. F. Hume, F.G.S., who states that the minerals present are of the same size as those from the Bagshot Sands and three times as large as those from the Chalk-marl of the Isle of Wight. The constitution of the compact Bargate Stone, with its sponge-spicules and silicified shell-structures, is described in detail; and a rare corallina and numerous arenaceous foraminifera are noticed.

2. The Bargate Series is well shown, along the lane crossing the hill below St. Martha's Chapel at Chilworth, with its pebbly beds, clay-seams, limestone, and sponge-beds. Dr. Hinde's descriptive notes on the sponge-spicules are given. Some detrital fragments of fossiliferous Oolitic rock described as of Jurassic age occur in these Neocomian strata, and are comparable with some of the material obtained from the deep boring at Richmond, Surrey, and probably derived from the old Jurassic ridge to which Godwin-Austen formerly made reference. The Author has found evidence in this neighbourhood of the Folkestone Sands lying unconformably on the Bargate Beds.

The clay-beds noticed by Dr. Fitton at Holloway Hill, Godalming, the Author refers to the Bargate Series. South of Dorking, also, Mr. Chapman found sand and clay of this Series on the Horsham Road.

The Ostracoda and Foraminifera found abundantly in some of the Bargate Beds in Surrey are then described in detail. Of the former there are 20 species and varieties, 7 of which are new; 9 have been previously described from Cretaceous strata, whilst 4 are Jurassic forms. Of the Foraminifera there are 139 species and varieties. Of these, 11 are described for the first time. There are besides 107 which have hitherto been unrecorded from beds of Neocomian age. The following 10 species and varieties have been known previously only from recent deposits, viz.:—*Haplophragmium foliaceum*, Brady; *Virgulina subdepressa*, Brady; *Ehrenbergina pupa* (d'Orb.); *Polymorphina sororia*, Reuss, var. *cuspidata*, Brady; *P. oblonga*, Will.; *P. regina*, Brady, Parker, and Jones; *Discorbina Bertheloti* (d'Orb.); *D. concinna*, Brady; *D. Vilardeboana* (d'Orb.); and *D. araucana* (d'Orb.). The large number of forms new to the Neocomian fauna is undoubtedly due to the fact that the deposits of the Bargate Series belong almost exclusively to the 'Laminarian' and 'Coralline' zones. Taking into consideration the facts that 23 per cent. of the forms recorded are almost peculiarly Neocomian types, that these added to known Cretaceous and Tertiary species amount to 122, or 87 per cent. (the latter additions probably being due to the circumstance that the Neocomian strata have not been so extensively examined in regard to their rhizopodal fauna as might have been desired), it is extremely probable that the microzoic fauna of the Bargate Series is almost entirely, though not quite (since we have a few Jurassic species present), indigenous to the deposit.

In conclusion, the Author states his indebtedness to Prof. T. Rupert Jones, F.R.S., and Prof. J. W. Judd, F.R.S.; to Dr. W. F. Hume, F.G.S., Dr. G. J. Hinde, V.P.G.S., Dr. J. W. Gregory, F.G.S., and Graf Solms-Laubach; and to George Murray, Esq., F.L.S.,—for valuable aid during the preparation of the present work.

2. 'On Deposits from Snowdrifts, with Special Reference to the Origin of the Loess and the Preservation of Mammoth-remains.' By Charles Davison, Esq., M.A., F.G.S.

When the temperature is several degrees below freezing-point, snow recently fallen is fine and powdery, and is easily drifted by the wind. If a fall of snow has been preceded by dry frosty weather, the interstitial ice in the frozen ground is evaporated, and the dust so formed may be drifted with the snow and deposited in the same places. The snowdrifts as a rule are soon hardened by the action of the sun or wind, and the dust is thus imprisoned in the snow. As the snow decays, by melting and evaporation, a coating of dust is extruded on the surface of the drifts, and, increasing continually in thickness as the snow wastes away, is finally left upon the ground as a layer of mud, which coalesces with that of previous years. The deposit so formed is fine in texture, unstratified, and, as experiments show, mica-flakes included in it are inclined at all angles to the horizon.

The Author describes several such deposits both in this country and in the Arctic regions: and suggests (1) that the loess is such a deposit from snowdrifts, chiefly formed when the climate was much colder, but still very slowly growing: (2) that mammoths suffocated in snowdrifts are subsequently embedded, and their remains preserved, in the deposits from them: and (3) that the ground-ice formation of Alaska, etc., is the remains of heavy snowdrifts when the coating of earth attained a thickness greater than that which the summer heat can effectually penetrate.

3. 'Additions to the Fauna of the *Olenellus*-zone of the North-west Highlands.' By B. N. Peach, Esq., F.R.S., F.G.S. (Communicated by permission of the Director-General of the Geological Survey.)

New material obtained by the Officers of the Geological Survey has been placed in the Author's hands, and as a result he is enabled to add information concerning the species of *Olenellus* previously described by him (*O. Lapworthi*); he also describes a new variety of this species, three new species of the genus, a new subgenus of *Olenellus*, and a form provisionally referred to *Bathynotus*.

He discusses certain theoretical points based upon the study of the remains described in the paper, and states that these make it probable that the dispersal of the *Olenellids* was from the Old World towards the New.

4. 'Questions relating to the Formation of Coal-Seams, including a New Theory of them: suggested by Field and other Observations made during the past decade on both sides of the Atlantic.' By W. S. Gresley, Esq., F.G.S.

A number of new facts are described, and the bearing of these and of previously recorded facts upon the origin of coal is discussed, special reference being made to the Pittsburgh Coal. The Author lays stress on the stratification of coal, the sharp line of demarcation between coal and underclays, the character of the plants in the underclays and their asserted root-nature, the existence of partings in such seams as the Pittsburgh Coal, which partings sometimes contain *Anthracosia*, and really separate the coal into distinct seams. He describes the occurrence of 'rods' of vegetable origin whose exact nature is not known, which, with ferns, he suggests contributed largely to the formation of some coals. He maintains that the evidence points to the formation of coal on the floor of an expanse of water, by vegetable matter sinking down from floating 'islands' of vegetation, which may have been of very large size, and enumerates cases of such 'islands' or 'rafts' of vegetation which have been described as existing in modern times.

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#### MISCELLANEOUS.

*Researches on the Structure, Organization, and Classification of the Fossil Reptilia.*—Part IX. Section 4. *On the Gomphodontia.* By H. G. SEELEY, F.R.S.

THE Gomphodontia is a group of Anomodont reptiles characterized by Theriodont dentition, in which the molar teeth are expanded transversely, more or less tuberculate, and have the crowns worn down with use, as in ungulate and other mammals. The orbit of the eye is distinct from the zygomatic vacuity, which is conditioned as in the Cynodontia, there being a long narrow parietal crest dividing the temporal vacuities. There are two well-defined occipital condyles united at the base, in a way that is closely paralleled in some mammals. The occipital plate is triangular, as in mammals, with no perforation except the foramen magnum. A deep superior notch defines the occipital plate from the lateral external squamosal bar. The malar bone, which forms the larger part of the zygoma, behind the orbit has a slight descending process, which varies in development. The hard palate terminates transversely in the middle length of the molar teeth. There is a descending transverse palatine arch situate behind the orbits. The incisor teeth are small and pointed; the canine teeth may be inconspicuous, but are usually large, compressed, and serrated; the premolars are small, circular,